Total Pages: 55

HEADQUARTERS
AERONAUTICAL SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

Technical Memorandum
ASNP-TM-61-28
24 November 1961

Directorate of Operational
Support Engineering
Deputy for Engineering
Account: 921A

QUALIFICATION TESTING OF THE PACIFIC SCIENTIFIC COMPANY'S ALTITUDE SENSITIVE ACTUATORS, NOS. 1201117-0, 1201118-0 AND 1201119-0

I. PURPOSE

To evaluate the three different types of altitude sensitive actuators for possible use in an Air Force multi-stage parachute system.

II. FACTUAL DATA

1. Test Items:

   a. Four altitude sensitive actuators, two each Part No. 121119-0 and one each Part No. 1201117-0 and 1201118-0, manufactured by the Pacific Scientific Company, were received from the Firewell Corporation, Buffalo, New York, on 18 October 1961 for qualification testing in accordance with the appropriate requirements as outlined in Item 2, Section II of this report.

   b. Two altitude sensitive indicators, one each Part No. 1201117-0 and 1201118-0 were subsequently received on 25 October 1961 after having been subjected to Items 4.1, 4.2, 4.5, 4.6 and 4.8.3 (of the requirements as outlined in Item 2, Section II of this report) by the Firewell Corporation.

   c. The actuators were designed to exert a force in excess of 100 pounds after a time delay of from 0.08 to 0.13 seconds after initiation. The various type actuators were precalibrated to fire at under 15,000 feet, under 16,500 feet and over 19,000 feet, respectively.

2. Test Requirements: The actuators were tested in accordance with requirements outlined in Appendix "K". These requirements are derived from the following Pacific Scientific Company Data Reports:

   a. Numbers 655, 656 and 657 dated 4 October 1961.

   b. Number 642 (as amended by conference of 19 September 1961).

3. Qualification Testing: A description of the testing appears in Appendix "B".

4. Test Results: The complete test results appear in Appendices "C", "D", "E", "F", "G" and "H".

5. Summary of Test Results: The test results are listed in Appendix "J".

III. CONCLUSIONS

1. The subject actuators, as submitted, did not meet the test requirements.

2. The subject actuators did pass a portion of the required tests after being modified (reference Appendix "B") by the Pacific Scientific Company representative present.

IV. RECOMMENDATIONS

It is recommended that three new actuators, one each of the types tested, be resubmitted to substantiate that all discrepancies have been corrected.

PREPARED BY:

RONALD C. LINEBACK
2LT, USAF

Publication Review

This report has been reviewed and is approved.

W. P. SHEPARDSON
Chief, Crew Equipment Division
Directorate of Operational Support
Engineering

APPENDIX A

DISTRIBUTION LIST (25)

Firewell Corporation (5)
3695 Broadway Avenue
Buffalo, New York

Pacific Scientific Company (5)
10242 Placentia Avenue
Anaheim, California

6511 Test Group (2)
USNAS
El Centro, California

ASNPSP-3 (12)

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APPENDIX B

QUALIFICATION TESTS

1. The qualification testing was carried out in four phases, as follows:

a. Phase I. Two actuators, one each Type 1201117 and 1201118, were tested by the Firewell Corporation in accordance with paragraphs 4.1, 4.2, 4.5, 4.6 and 4.8.3 of the requirements referenced in Item 2, Section II of this report.

b. Phase II. The above-described actuators were then tested by the Aeronautical Systems Division in accordance with paragraphs 4.8.4 and 4.8.5 of the referenced requirements.

c. Phase III. Simultaneously with the above testing, one actuator (Type 1201118) was tested in accordance with paragraphs 4.7.2, 4.7.3, 4.8.6, 4.8.7 and 4.8.8 of the referenced requirements.

c. Phase IV. Two actuators, Type 1201119, were concurrently tested with the above in accordance with paragraphs 4.3, 4.4, 4.7.2, 4.7.3, 4.7.4, 4.8.1 and 4.8.2 of the referenced requirements.

2. The following discrepancies were noted during the tests:

a. Five of the six test samples could not be cocked after three to eight firings. These failures were considered by the Pacific Scientific representative to be due to scoring of the power spring guide assembly by the power spring (belleville washers). This fault was apparently corrected by hardening the guide assembly and tumbling the belleville washers to eliminate sharp edges. A life test of 75 firings was conducted successfully after the parts were changed.

b. The reset tool (temporary cocking pin) consistently became prematurely disengaged. This was considered to be the result of improper tempering and configuration of the pin retaining spring and by the lack of an arming pin guide bushing. The first set of pins were not hardened and the retaining shoulder broke down. A second set of pins were supplied and these proved more usable although one of these broke during the cold temperature test.

c. The test sample #201 would not fire after being armed and shocked at 16,500 feet and then being taken up to 26,000 feet. The unit was torn down and the head of a small hollow pin in the transfer shaft was found to be causing hang up when the aneroid tripped the release mechanism. This was corrected by use of a file and the shock and acceleration tests were then conducted successfully.

d. The devices consistently fired within an altitude range of ± 500 feet at ambient conditions and within ± 1,000 feet at high and low temperature. However, it is to be noted that the calibration of the various devices was such as to allow firings to overlap or occur outside of the required 15,000 and 19,000 feet intervals.

e. The timers on devices #204 and #205 proved to be adversely affected by exposure to cold temperature. The time delay varied from 0.28 to 0.41 seconds. (Requirement .08 to .13)

f. The hollow pins retaining the arming levers to their respective shafts were found to fail with a force of from 10 to 12 pounds exerted on the lever. One pin failed (sheared) during test. It was understood that this pin is to be replaced by a solid 0.060 inch diameter pin.

g. The leak indicators on four of the six devices became inoperative either as a result of unrestrained firing or from the shock tests. The manufacturer is understood to be correcting this fault by adding two more teeth to the follower sector of the altitude indicator.

APPENDIX C

ACCELERATION

Report No.	Page
61-156-223	7 - 10

AERONAUTICAL SYSTEMS DIVISION
WRIGHT AIR DEVELOPMENT DIVISION

WRIGHT-PATTERSON AIR FORCE BASE, OHIO

DEPUTY FOR TEST AND SUPPORT

(ASTEVD) ENVIRONMENTAL DIVISION
DIRECTORATE OF ENGINEERING TEST LABORATORY

EVALUATION REPORT

AUTOMATIC PARACHUTE ACTUATORS

REPORT NR: 61-156-223

PROJECT NR: 5778

MANUFACTURER: Pacific Scientific Co.

SUBMITTED BY: ASNPSP3 (Lt. Lineback)

DATE:

TYPE EVALUATION: Acceleration

SPEC NR: Exhibit WCLSJ-1-23075

ITEM SERIAL NR: 120-1118
120-1117

Test Conducted: 31 Oct 61

1. PURPOSE:

To evaluate the operational response and the post test effects of sustained acceleration on two automatic parachute actuators.

2. FACTUAL DATA:

a. The two devices submitted for testing are used in a multistage parachute operation. The design of both is nearly identical and differ substantially only in the altitude at which each unit is set to trigger.

b. The actuator identified as the drogue deploy is adjusted to function at or above 19,000 feet ±500 feet. The drogue release actuator is adjusted to trigger at 16,500 feet ±500 feet.

c. For the acceleration test each device in turn was mounted on a suitable fixture and secured to the test platform of the instrument centrifuge. Each actuator was subjected to 30 'g' of sustained acceleration for 1 minute, in the plus and minus direction, along the three principal axes. Fig. 1 Appendix A of this report illustrates the direction of the applied 'g'.

d. The drogue release was powered, and fired for each orientation, after one minute of acceleration. The drogue deploy was powered for each mounting position, accelerated for one minute, but not fired while on the centrifuge. The final step in the test procedure of the drogue deploy, consisted of placing the instrument in an altitude chamber and evacuating the latter to an equivalent of 19,000 feet, or until the actuator fired.

3. CONCLUSIONS:

The automatic parachute actuators submitted for acceleration testing,

successfully negotiated the requirements of the test procedure.

4. RECOMMENDATIONS:

None. Data submitted for information.

PREPARED BY:

RICHARD C. McKINNEY
Test Project Engineer

CONCURRED IN:

LOUIS SCHAFFER
Colonel, USAF
Directorate of Engineering Test
Deputy for Test and Support

CONCURRED IN:

HUGH S. LIPPMAN
Technical Director
Deputy for Test and Support

APPROVED BY:

APPENDIX "A"

Figure 1
Automatic Parachute Actuators

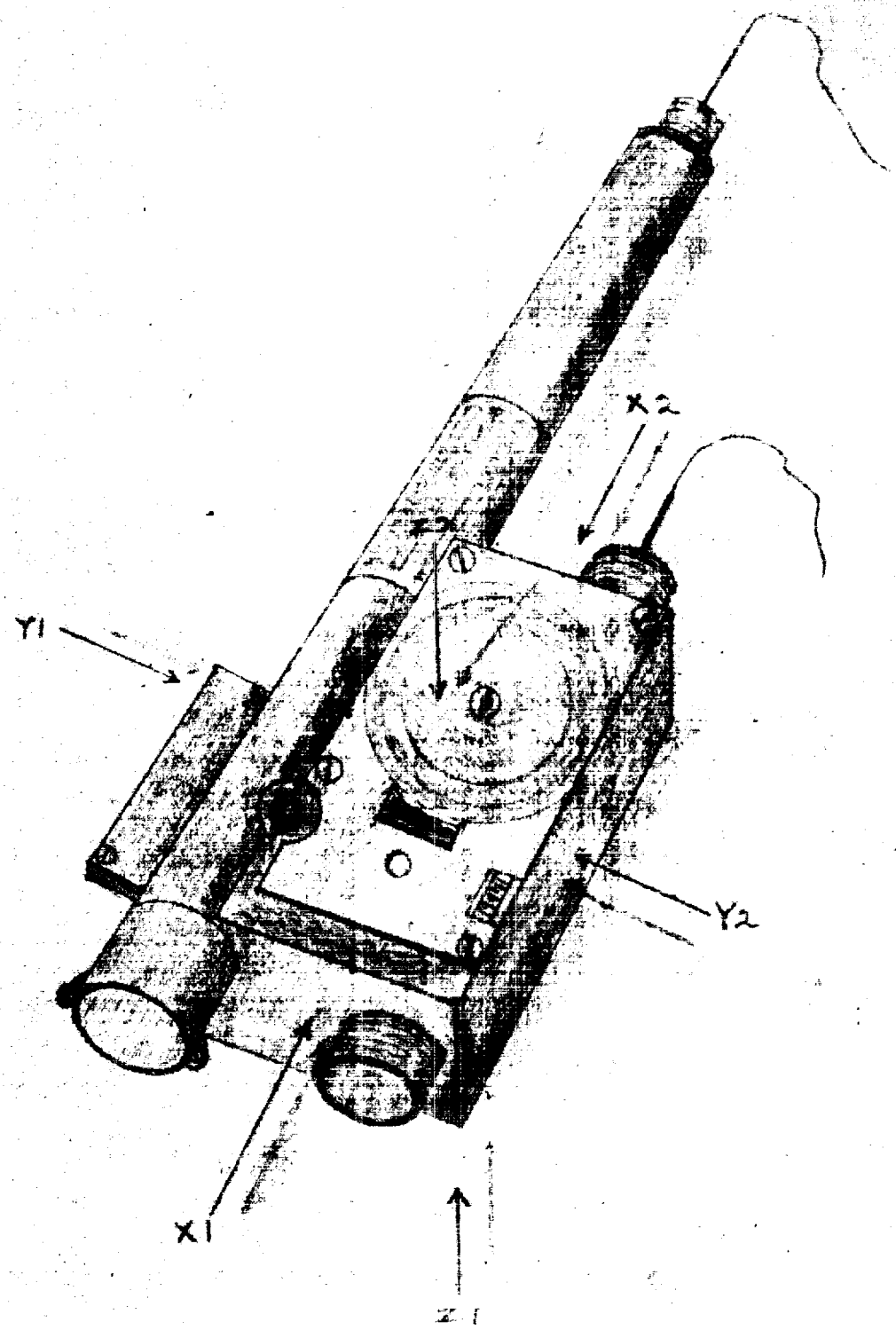


FIG-1

SUBJECT
AUTOMATIC PARACHUTE ACTUATORS.
TEST NO.
61-156-223
PROJECT NO.
5763
DATE
24 Oct 1961

10

APPENDIX D

SHOCK

Report No.	Page
61-156-222 (ASTEVD)	12 - 15

AERONAUTICAL SYSTEMS DIVISION
[redacted]
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

DEPUTY FOR TEST AND SUPPORT
DIRECTORATE OF LABORATORIES

(ASTEVD) ENVIRONMENTAL DIVISION
DIRECTORATE OF ENGINEERING TEST LABORATORY

EVALUATION REPORT

AUTOMATIC PARACHUTE ACTUATORS

REPORT NR: 61-156-222 (ASTEVD)
DATE:
PROJECT NR: 5778
TYPE EVALUATION: Shock
MANUFACTURER: Pacific-Scientific Co.
SPEC NR: Data Report 642
SUBMITTED BY: ASNPSP-3 (Lt. Lineback)
ITEM SERIAL NR: 1201118 -203
1201118 -201

1. PURPOSE:

To test two each parachute actuators submitted by the Firewell Corporation and manufactured by the Pacific-Scientific Company.

2. FACTUAL DATA:

a. This test was conducted on 26-27 Oct 1961.

b. The parachute actuators are intended for a classified project.

c. The testing was accomplished in accordance with Pacific-Scientific Data Report No. 642 dated 13 July 1961 amended 19 September 1961 and instructions from Project Engineer, Lt. Lineback.

d. The equipment used to perform this test was a Jan-S-44 type shock machine with a plate spring having a spring constant of 1590 lbs/in installed in an altitude chamber.

e. Procedure for actuator 1201118 S/N 203:

(1) With actuator S/N 203 loaded and arming pin inserted, the specimen was mounted on the shock machine to correspond with the direction of intended shock.

(2) The altitude was then increased to 18,500 ft. (prescribed by project engineer, Lt. Lineback).

(3) The arming pin was removed and the specimen was subjected to 30 g shock, while noting if release pulled the power cable during shock.

(4) The altitude was then decreased to ambient pressure, noting and recording the altitude at which the release pulls the power cable.

(5) Steps 1-4 were then repeated for the five remaining directions of shock. (6 directions total).

f. Procedures for actuator 1201118, S/N 201.

(1) With actuator S/N 201 loaded and arming pin removed, the specimen was mounted on the shock machine to correspond with the direction of intended shock.

(2) The altitude was then increased to 16,500 ft (prescribed by project engineer).

(3) The actuator was then subjected to 30 g shock, while noting if the release pulled power cable during shock.

(4) The altitude was then increased at the rate of 100 ft/sec, noting and recording the altitude at which the release pulls the power cable.

(5) Steps 1-4 were then repeated for the five remaining directions of shock.

g. Mr. George Goodrich and Mr. Verne Morgan of Pacific Scientific were present during the test to perform minor maintenance and repair on the actuators. Lt. Lineback of ASNPSP-3 was an observer of the test and made alterations in the test procedures as outlined in this report.

h. RESULTS -

The following chart indicates the shock altitude and release altitude:

RUN	UNIT NO.	POSITION	ARMING ALT.	SHOCK ALT.	RELEASE ALT.
1	S/N 203	longitudinal pin-down	20,500 ft	20,500 ft.	17,000 ft.
2	"	" pin-up	18,500	18,500	17,000
3	"	edgewise spring-up	18,500	18,500	16,900
4	"	" spring-down	18,500	18,500	17,100
5	"	Sideways face-up	18,500	18,500	17,500
6	"	" face-down	18,500	18,500	17,300
7	S/N 201	longitudinal pin-up	station alt. =	16,500 to	26,500 no release
7.1	"	repeat 7	" "	16,500	19,600
8	"	pin down	" "	16,500 to	23,500 no release
8.1	"	repeat 8	" "	16,500	19,600
9	"	edgewise spring-up	" "	16,500	19,500
10	"	" spring-down	" "	16,500	19,500
11	"	sideways face-up	" "	16,500	19,400
12	"	" face-down	" "	16,500	19,900

After run 3 specimen S/N 203 was pulled for repairs due to loading difficulties. The same symptom was encountered after runs 4 and 5, however, through some manipulation of the loading spring, the actuators were loaded.

After shock in run Number 7, the actuator failed to release even though the altiude was permitted to attain 26,500 ft. Scoring of the aneroid shaft was thought to be the cause of failure. Actuator S/N 201 was examined by Mr. Morgan and adjusted. After the corrective action Release Approved For Release 2003/03/10 : CIA-RDP75B00285R000400070002-9 in the chamber, however, difficulty was encountered in loading.

The actuators did not pull the power cables during the shocks. From information received from the project engineer, the release altitudes should be 16,500 ft for S/N 203 and 18,500 ft for S/N 201. The recorded release altitudes of these actuators when they operated properly were not within the limits of +500 ft. In the repairing of the actuators, the aneroid barometers were not recalibrated, therefore, the release altitude was altered. All release altitudes were within a 600 ft range hence the aneroid setting could have been changed to a setting within this 600 ft difference and the +500 ft limit could be met. The releases were to be checked for release altitude in an altitude chamber in Building 45. The data from these runs will be taken into consideration by the project engineer.

3. CONCLUSIONS:

Due to the amount of repair required on these actuators during the test and from the information received from the project engineer, it cannot be absolutely determined if shock caused the failure. It also appears that these items may be unreliable especially if product control is not rigid.

4. RECOMMENDATION:

It is recommended that these items be completely retested under conditions of shock after they have been properly reworked.

GEORGE A. KLASCH
Colonel, USAF
Asst Deputy for Test and Support

APPENDIX E

ANEROID CYCLING, OVERPRESSURE, TIMER ACCURACY,
ANEROID ACCURACY, ANEROID HYSTERESIS,
HIGH ALTITUDE - LOW TEMPERATURE
AND HIGH TEMPERATURE

Report No.	Page
ASTEVS-61-156-224	17 - 20

AERONAUTICAL SYSTEMS DIVISION
WRIGHT AIR DEVELOPMENT CENTER
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

4 Pages
ASTEVS/AC/ja

Environmental Division
Directorate of Engineering Test

EVALUATION REPORT

Automatic Parachute Actuators

REPORT NR: ASTEVS-61-156-224

DATE:

PROJECT NR: 5778

TYPE EVALUATION: Aneroid Cycling, Overpressure, Timer Accuracy, Aneroid Accuracy, Aneroid Hysteresis, High Altitude - Low Temp, and High Temp.

MANUFACTURER: Pacific Scientific Company

SUBMITTED BY: ASNPSP-3
Major A. N. Abelson

Exhibit Nr: WCL3J-1-23075
Item Part Nr: 120119-0
Item Ser Nrs: 204 and 205

1. PURPOSE: To obtain operational data on two automatic parachute actuators when subjected to various test conditions.

2. FACTUAL DATA:

a. The actuators are designed to pull the ripcord of a parachute after a time delay of between .08 and .13 seconds provided they are within a pressure altitude of 15,000 ± 500 feet at normal ambient and 15,000 ± 1,000 feet at low or high temperature (-65°F or 160°F).

b. Testing of the actuators was accomplished in accordance with a suborder submitted by Major A. N. Abelson, ASNPSP-3, dated 3 October 1961. This suborder outlined the testing procedures in accordance with a Pacific-Scientific Report Nr. 642, amended by a Memorandum for Record dated 12 September 1961. Additional operational criteria for these tests were furnished by Lt. R. C. Linsbeck, ASNPSP-3. Each testing procedure covered by this report will contain the appropriate heading and respective paragraph number referenced in Report Nr. 642.

c. Operational testing of the actuators was started on 19 October 1961 and was completed on 2 November 1961. During this time the actuators were subjected to the following tests in the order listed: Aneroid Accuracy, Timer Accuracy, Aneroid Hysteresis, Aneroid Cycling, Overpressure, High Altitude-Low Temperature, and High Temperature. Operational discrepancies noted during these tests were as follows. During the aneroid accuracy test the aneroid leak indicator on each actuator became defective resulting in inaccurate altitude indications at simulated altitude conditions. It was noted during the test phases through the aneroid cycling that the power cable spring latching mechanism became difficult to engage necessitating the replacement of the power spring guide cylinder on each actuator. After the overpressure test the aneroid release point on actuator Nr. 204 was below the operational requirement. Testing at low temperature found the aneroid release point on actuator Nr. 204 to be below the operational requirement. The timer mechanism on each actuator at low

perature operated above the operational requirements. At high temperature the aneroid release point on actuator nr. 209 was above the operational requirement. It was also noted throughout all these tests that the actuator arming pins had poor retention when inserted into the arming slot. This necessitated frequent pin replacement and retention spring adjustment.

d. Upon completion of testing the actuators were returned to Lt. R. J. Finelli ck. A complete description of all tests is presented in a chronological order as Appendix A of this report.

5. Conclusion: The automatic parachute actuators used in this test failed to satisfy all the operational requirements of this test.

6. Recommendation: It is recommended that the actuators be considered unsatisfactory for service use under the conditions imposed during this test.

Submitted by: [illegible]
Test Project Engineer

Concurred by: [illegible]
Colonel, USAF
Director of Engineering Test
Deputy for Test and Support

Concurred by: [illegible]
Technical Director
Deputy for Test and Support

Approved by:
GEORGE A. KIRSCH
Colonel, USAF
Ass't Deputy for Test and Support

1. Aneroid accuracy (Para. 4.7.1). Each actuator was subjected to a simulated altitude of 20,000 feet and the arming pin was pulled. The test chamber altitude was lowered at a rate of 120 feet per second and each aneroid release point was noted. Actuator nr. 204 operated at 14,900 feet and actuator nr. 205 operated at 15,500 feet. Both operations were within the operational requirement of 15,000±500 feet. It was noted during this test phase that the aneroid leak indicator on each indicator had become defective and was indicating below the sea level range when the actuators were at station pressure. This caused the indicators to indicate inaccurately at simulated altitude conditions. No further checks were made of these indicators during the remainder of operational tests.

2. Timer accuracy (Para. 4.7.2). Six timer operational checks were made on each actuator. The time delay, after pulling the arming pin, varied between .10 and .12 seconds for each actuator. These timer operations were within the operational requirements of between .08 and .15 seconds.

3. Aneroid hysteresis (Para. 4.7.4). The actuators were subjected to a simulated altitude of 30,000 feet and each actuator arming pin was pulled. The test chamber altitude was lowered at a rate of 200 feet per second and each aneroid release point was noted. Actuator nr. 204 operated at 14,900 feet and actuator nr. 205 operated at 15,100 feet. Both operations were within the operational requirement of 15,000±500 feet.

4. Aneroid Cycling (Para. 4.5). Both actuators were subjected to continuously varying altitude cycles at room temperature (+75°F) from station pressure to 35,000 feet and return to station pressure. This constituted one complete cycle and 1000 such cycles were imposed on each actuator. Upon completion of the 1000 cycles an aneroid accuracy check was made on each actuator. With an altitude descent rate of 120 feet per second, actuator nr. 204 operated at 15,000 feet and actuator nr. 205 operated at 15,000 feet. Both actuators operated within the operational requirement of 15,000±500 feet. It was noted up to this time that throughout the first four test phases that the actuator power cable spring latching mechanism became difficult to engage. Corrective action was taken by the manufacturer's representative Mr. V. Morgan by replacing the power spring guide cylinder on each actuator.

5. Overpressure (Para. 4.4). The actuators were subjected to an absolute pressure of 50 inches Hg for a period of one hour. Upon completion of the one hour overpressure the actuators were returned to atmospheric pressure and subjected to this condition for a period of 72 hours. An aneroid accuracy check was then conducted on each actuator. Actuator nr. 204 operated at 14,400 feet and actuator nr. 205 operated at 15,400 feet. Actuator nr. 205 operated within the operational requirement of 15,000 ±500 feet but actuator nr. 204 was below.

6. High Altitude - Low Temperature (Para. 4.8.1). Both actuators were subjected to an ambient temperature of -65°±2°F and a simulated altitude of 50,000 feet for a period of four hours. Upon completion of these four hours the actuators were subjected to an ambient temperature of -65°±2°F at station pressure for an additional period of four hours. Upon completion of this exposure, and while still at -65°±2°F, an aneroid accuracy and timer accuracy check was made on each actuator. The aneroid on actuator nr. 204 operated at 13,750 feet and the time delay on four timer operations were .14,

.41, .32, and .28 seconds. The aneroid on actuator nr. 203 operated at 4,650 feet and the time delay on four timer operations were .34, .4, .37, and .31 seconds. The aneroid operation of actuator nr. 203 was within the operational requirement of 4,500 ±1000 feet but the aneroid on actuator nr. 204 did not fulfill this requirement. The timer operation on both actuators was in excess of the time delay requirement of between .08 and .14 seconds.

7. High temperature (Para. 4.6.7). The actuators were subjected to an ambient temperature of 160°F ± 2°F for a period of 4 hours. Upon completion of this exposure, and while still at that temperature, an aneroid accuracy check was made on each actuator. The aneroid on actuator nr. 204 operated at 4,300 feet and the aneroid on actuator nr. 203 operated at 16,100 feet. Three timer accuracy checks were made on each actuator with all time delays being recorded as between .10 and .11 seconds. The aneroid operation of actuator nr. 204 was within the operational requirement of 4,500 ±1000 feet but the aneroid on actuator nr. 203 did not fulfill this requirement. The timer operation on both actuators was within the operational requirement of between .08 and .14 seconds. No further testing was conducted.

APPENDIX F

SALT FOG, SAND AND DUST, AND HUMIDITY

Report No.	Page
ASTEVS-61-155-217, 218, 219	22 - 25

AERONAUTICAL SYSTEMS DIVISION
WRIGHT AIR DEVELOPMENT CENTER
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

4 Pages
ASTEVS/MPO/jm

Environmental Division — Directorate of Engineering — Test

EVALUATION REPORT
Automatic Parachute Actuator, 1 Ea.

REPORT NR: ASTEVS-61-155-217, 218, 219
DATE:
PROJECT NR: 5778
TYPE EVALUATION: Salt Fog, Sand & Dust, Humidity
MANUFACTURER: Pacific-Scientific Co.
SPEC NR: Data Report 642
SUBMITTED BY: ASNPSP-3 Major A. M. Abelson
ITEM SERIAL NR: 202
Part Nr: 1201118-0

1. PURPOSE: To determine the resistance of the actuator to salt fog, sand and dust, and humidity test conditions.

2. FACTUAL DATA:

a. The actuator is a device which is intended to release a parachute ripcord automatically at a preset altitude.

b. The release was tested in accordance with the applicable paragraphs of Specification MIL-E-5272 as stipulated in Data Report 642 as changed by conference held on 19 September 1961.

c. The test schedule was as follows:

(1) The salt fog test was conducted in test facility nr. 45-7 for 50 hours starting on 23 October 1961 and terminating 25 October 1961.

(2) The sand and dust test was conducted in test facility nr. 45-6 for 12 hours starting 25 October 1961 and terminating 26 October 1961.

(3) The humidity test was conducted in test facility nr. 45-4 for one 24 hour cycle from 26 October 1961 to 27 October 1961 after which the test item was moved to a humidity chamber in Building 22 where four additional cycles were completed from 30 October 1961 to 3 November 1961. The total exposure time was 120 hours.

d. During exposure to environmental test conditions the actuator was inside a parachute pack as required by the applicable specifications.

e. At the end of the salt fog test, the exterior of the actuator housing was free of visible salt fog condensate; however, rust on internal components was considered to be evidence that some salt fog had entered the case. When the actuator was operated in altitude facility nr. 45-11, it pulled the ripcord cable at 16,500

feet which was satisfactory. Difficulty was experienced in resetting the release for the next test; however, this condition was found to be due to faulty manufacture and not to the environmental test conditions. The manufacturer's representative, who was summoned by the project engineer, examined a prototype release which had the same defect in the resetting mechanism. The representative claimed to have determined the proper corrective action to be taken.

f. At the end of the sand and dust exposure period, the actuator was removed from the parachute pack and found to be externally and internally free of sand and dust. When the actuator was tested in altitude facility nr. 45-11, it pulled the ripcord cable properly at 16,700 feet and was considered to be satisfactory.

g. At the end of the humidity exposure period the actuator was removed from the parachute pack. It was found to be covered with moisture both internally and externally. Rust that started in the preceding salt fog test was advanced. Photograph nr. 61-4691, Appendix "A" of this report illustrates the extent of the rust. The actuator was subjected to a functional test in the stratosphere chamber in Building 22. The first attempt to trigger the actuator was unsuccessful because the firing pin was restrained by excessive friction. The actuator was then repositioned so that it could be triggered by means of the side lever. The actuator pulled the ripcord cable at 16,000 feet and was considered to be satisfactory. Examination of the firing pin disclosed that the friction was due to rust.

h. Lt. Linebuck, a representative of the project engineer, participated in the functional tests following exposure to the environmental conditions.

3. Conclusions:

a. With the exception of the rust and the difficulty with the reset mechanism, as referenced above, the actuator is considered to have withstood the salt fog test conditions to which it was exposed.

b. The actuator is considered to have withstood the sand and dust test conditions to which it was exposed.

c. Due to the presence of moisture inside the case of the actuator and the rust as referenced above, the actuator is not considered to have withstood the humidity test conditions to which it was exposed.

4. Recommendations: It is recommended that:

a. The actuator be considered resistant to salt fog as represented by the above described test, provided the components that rusted are adequately protected.

b. The actuator be considered resistant to sand and dust as represented by the above described sand and dust test.

c. The actuator be considered nonresistant to humidity as represented by the above described humidity test.

d. The case of the actuator be improved to exclude humidity from the interior.

e. The resetting mechanism of the release be modified as necessary to eliminate the difficulty referenced in paragraph 2e.

[illegible]

[illegible] Test Project Engineer

[illegible]

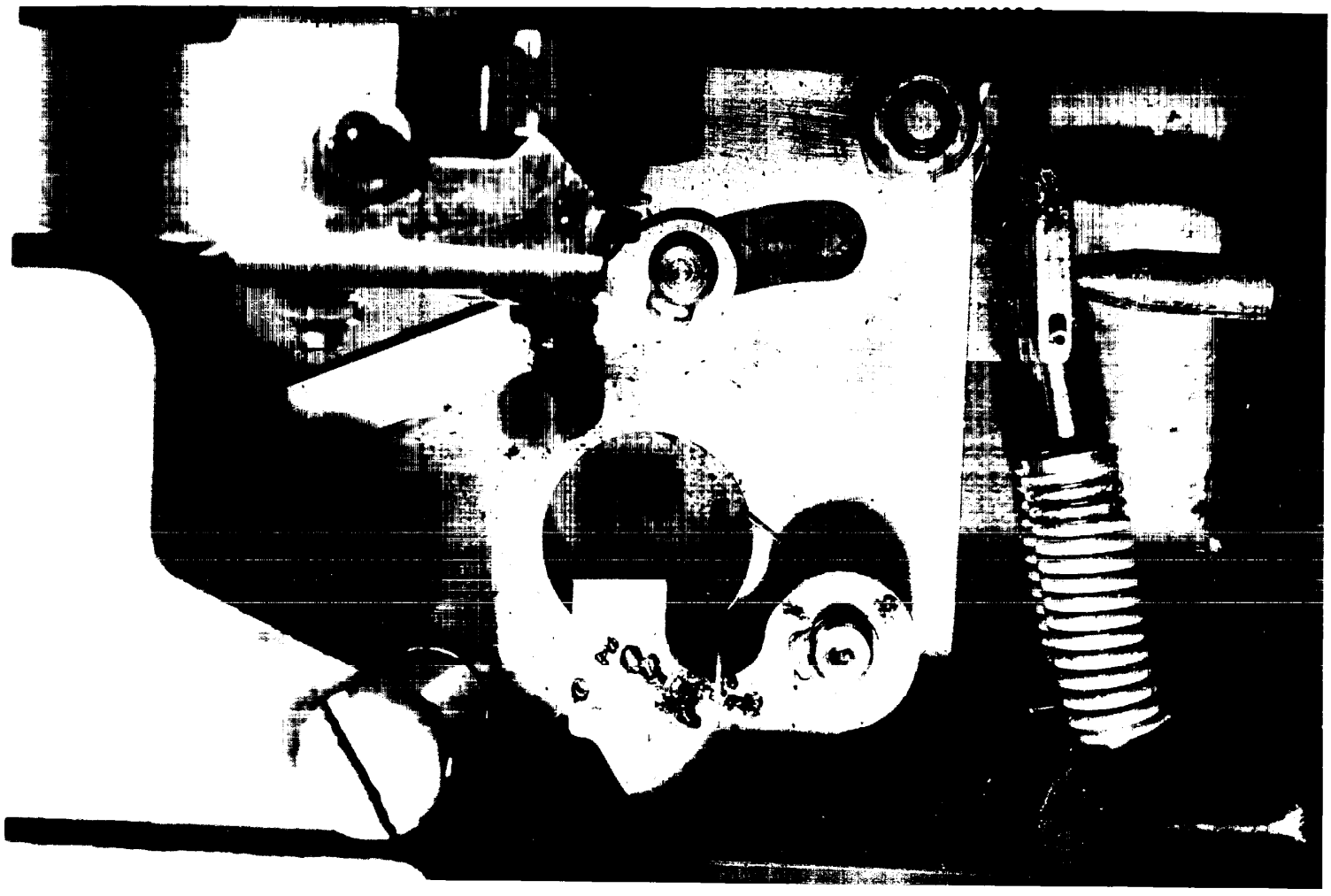
[illegible]
Colonel, USAF
Director of Engineering Test
Deputy for Test and Support

[illegible]

[illegible]
Technical Director
Deputy for Test and Support

[illegible]

GEORGE A. KIRSCH
Colonel, USAF
Ass't Deputy Comdr/Test and Support



AUTOMATIC PARACHUTE
ACTUATOR AFTER SALT FOG TEST NR. 61-155-219

ASD
ASTDP

DATE: 3 NOV 61
NEG. NR. 61-4031

APPENDIX G

QUALIFICATION TESTS PERFORMED ON PACIFIC SCIENTIFIC CORP.
PARACHUTE ACTUATOR NUMBER 1201117-0

Report	Page
Firewel Report dtd 2 Nov 1961	27 - 37

THE FIREWEL CO. INC.
Subsidiary of the Aro Equipment Corporation
3695 BROADWAY BUFFALO 25, N. Y.

November 2nd, 1961

QUALIFICATION TESTS PERFORMED ON
PACIFIC SCIENTIFIC CORP. PARACHUTE
ACTUATOR NUMBER 1201117-0

by The Firewel Company, Buffalo, N. Y.

Prepared by:

James K. Seitler
Design Engineer

Approved by:

Alfred C. Barnasse
Project Engineer

Robert F. Zumwalt
Director of Research

THE FIREWEL CO., INC.
Subsidiary of the Aro Equipment Corporation
3695 BROADWAY BUFFALO 25, N. Y.

TABLE OF CONTENTS

THE FIREWEL CO., INC.
Subsidiary of the Aro Equipment Corporation
3695 BROADWAY BUFFALO 25, N. Y.

1. PURPOSE:

Perform the portion of the qualification testing of the Pacific Scientific Corporation Parachute Actuator Number 1201117-0 assigned to the Firewel Company.

2. REFERENCE SPECIFICATION:

Pacific Scientific Corporation
Number 655 -- Qualification Test Procedure for Drogue Deploy Actuator Number 1201117-0

WADC Exhibit WCLSJ-1-23075, Appendix A, dated November 26th, 1957

ASD Document Data Report 642 as changed by Conference of September 19th. 1961.

3. QUANTITY OF TEST ARTICLES:

One each -- Drogue Deploy Actuator Number 1201117-0
Serial Number 201

4. TEST PROCEDURE:

Paragraphs 4.1, 4.2, 4.5, 4.6 and 4.8.3 of ASD Document Data Report No. 642 as changed by the Conference of September 19th, 1961 were performed by the Firewel Company. Numbers in parenthesis refer to the referenced document.

4.1 Examination of Product (4.1):

4.1.1 The specimen examined conformed to the applicable drawing except that the guide bushing for the arming pin had not been assembled into the unit.

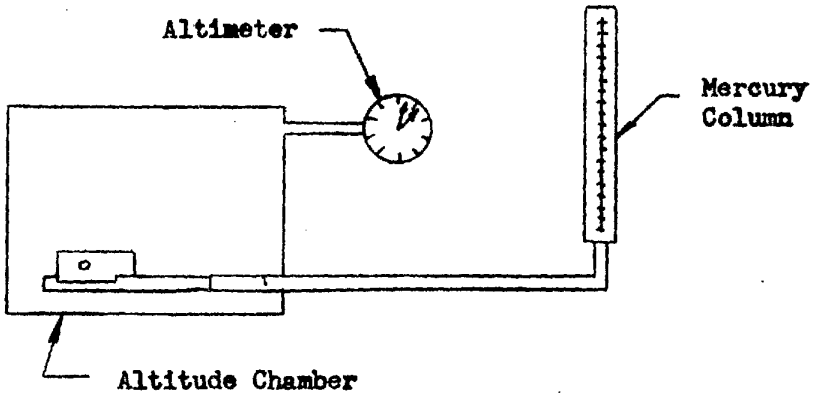
4.2 Venting Test (4.2):

4.2.1 Test Procedure:

With the arming pin removed, the actuator was placed in an altitude chamber. A rubber tube was placed over the cable guide and connected to a mercury column.

The altitude was raised to 25,000 feet and then lowered at a rate between 150-250 FPS. The difference in the mercury column and altitude chamber readings should not exceed 100 feet. This test was performed twice.

4.2.2 Test Setup:



4.2.3 Test Results:

ALTITUDE CHAMBER READINGS	Hg COLUMN (± 100 FEET)
25,000 feet	OK
20,000 feet	OK
15,000 feet	OK
10,000 feet	OK
0 feet	OK

4.2.4 Remarks:

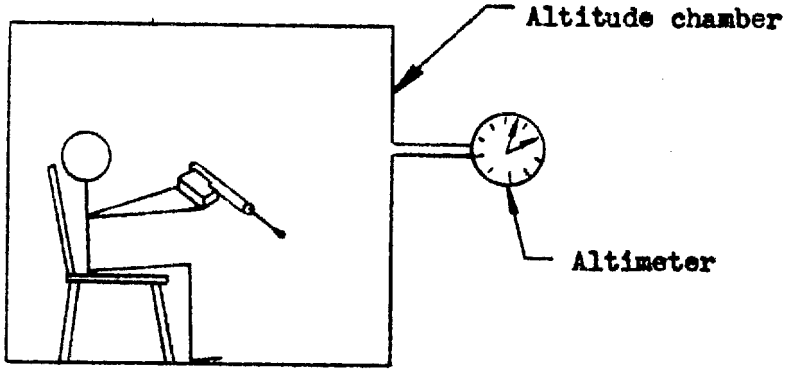
The actuator performed satisfactorily.

4.3 Timer Starting Life Test (4.5):

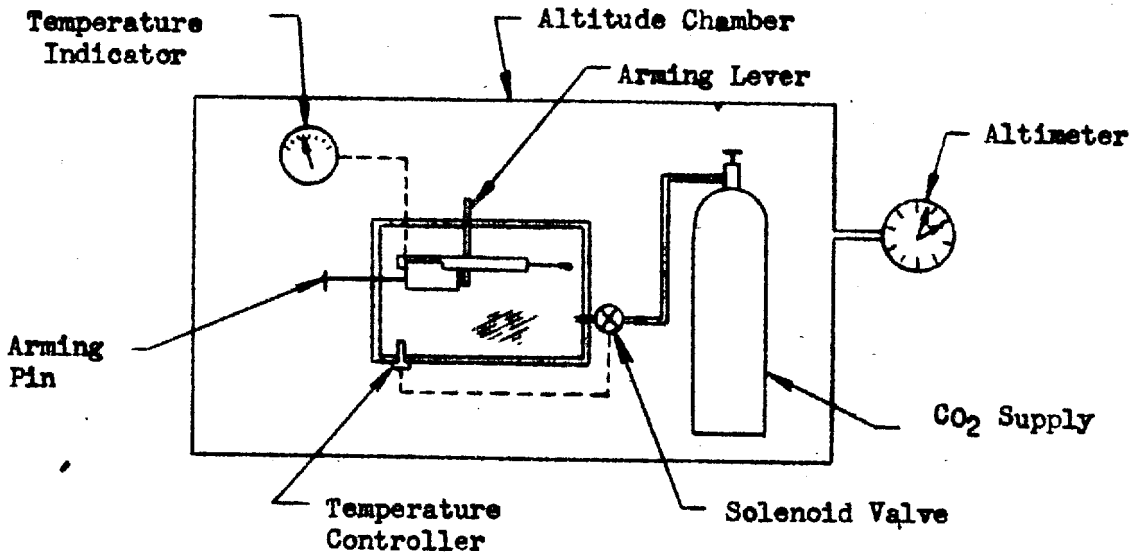
4.3.1 Test Procedure:

With the power spring NOT loaded, the power gear train was started by extracting the arming pin 300 times at room temperature. The same starting operation was conducted an additional 200 times, between -60° and -65°F. Because of the aneroid block on this unit, the tests were conducted in an altitude chamber at an altitude of 21,000/22,000 feet.

4.3.2 Test Setup:



AMBIENT (74°F) TEMPERATURE CONDITIONS



-60/-65°F TEMPERATURE CONDITIONS

THE FIREWEL CO., INC.
Subsidiary of the Aro Equipment Corporation
3695 BROADWAY BUFFALO 25, N. Y.

4.3.3 Test Results:

TEST CONDITIONS	TEST	REMARKS
Ambient Test	300 cycles	OK
-60°/-65°F Test	200 cycles	OK

4.3.4 Remarks:

After 110 actuations, the arming pin began to fail. This was caused because the pins had not been properly heat treated. New pins corrected the situation. The arming pin hole in the body casting showed signs of wear. This was due to the fact that the units were supplied without bushings as noted in paragraph 4.1. The 200 cycles cold test was performed by arming the unit at 18,000 feet, raising the chamber to 21,000 feet to set the mechanism and then firing for 30 cycles. The remaining 170 cycles were performed at 21,000 feet. The actuator operated satisfactorily.

ARO Firewel THE FIREWEL CO., INC.
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4.4 Power Actuation and Life Test (4.6):

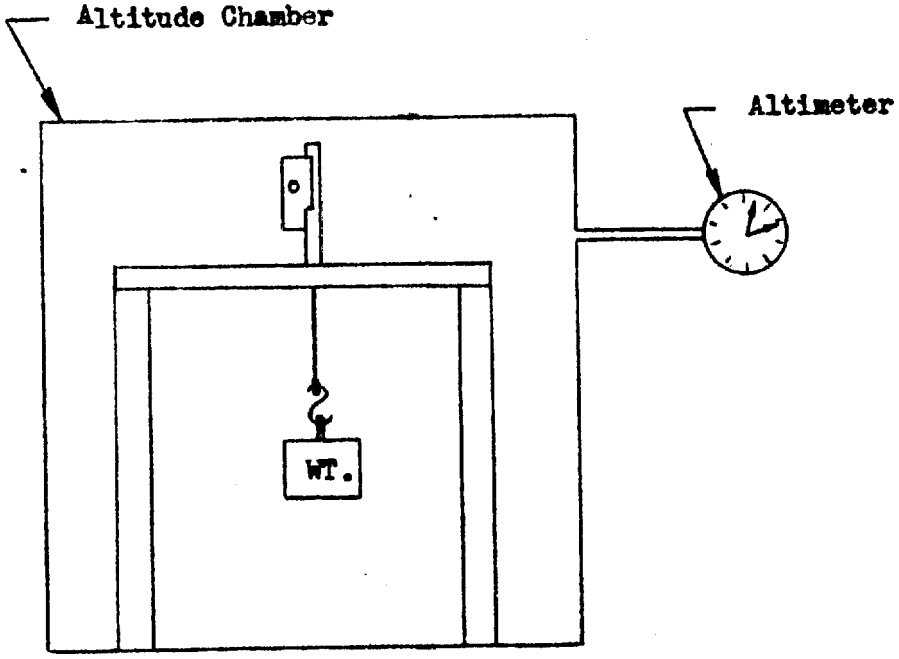
4.4.1 Test Procedure:

The actuator was loaded, mounted in a test fixture and operated fifty times with a 30-pound weight attached to the swaged fitting on the power cable.

The test was repeated 25 times with a 100-pound weight. The 100-pound weight was lifted at least two inches each time.

Because of the aneroid block on this unit, the tests were conducted in an altitude chamber at 21,000 feet at room temperature 74°F. The actuator was loaded each time with the resetting tool No. 1201138.

4.4.2 Test Setup:



4.4.3 Test Results:

TEST	LOAD	REMARKS
50-cycle	30 pounds	OK
25-cycle	100 lbs - 2" lift	OK

4.4.4 Remarks:

Actuator operated satisfactorily.

ARO Firewel THE FIREWEL CO., INC.
Subsidiary of the Aro Equipment Corporation
3695 BROADWAY BUFFALO 25, N. Y.

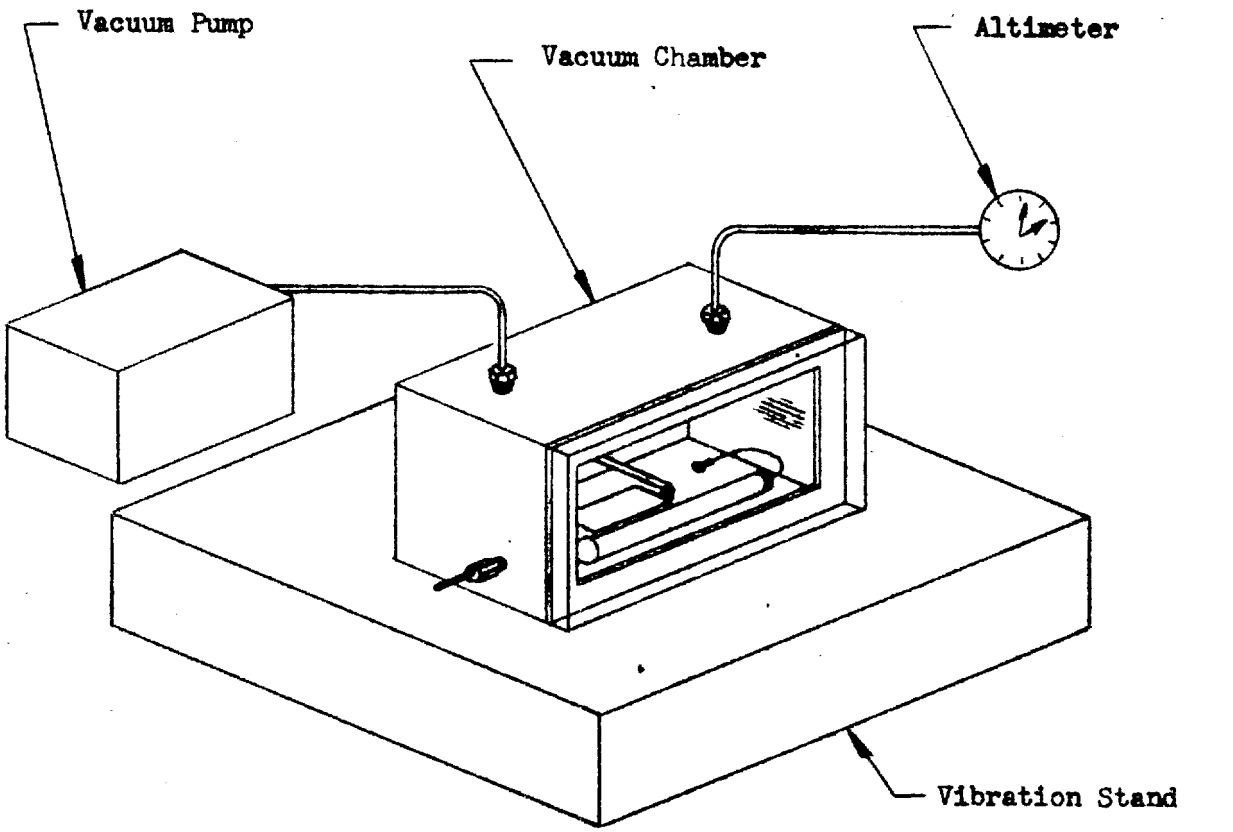
4.5 Vibration (4.8.3):

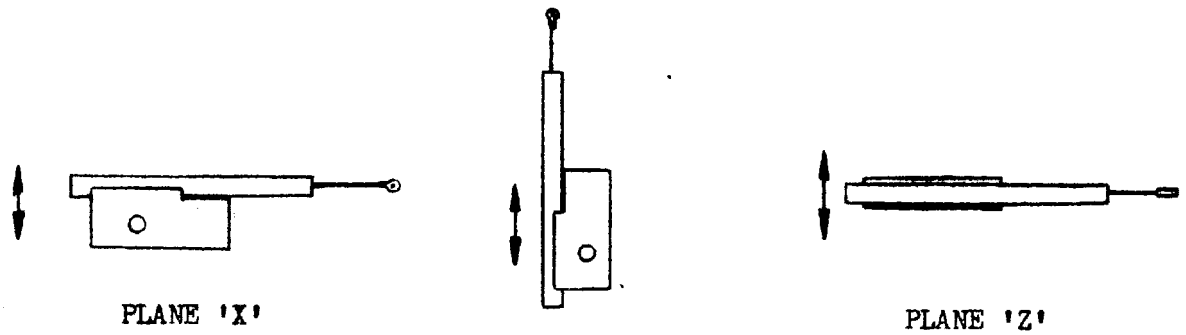
4.5.1 Test Procedure:

The actuator, cocked and with the arming pin inserted was subjected to linear vertical vibration for thirty minutes in each of three mutually perpendicular planes on a vibration stand. When mounted in the horizontal plane, the actuator was mounted upside down. In one of the positions the actuator was mounted so that the pawl for the reel actuator had the additional force of gravity tending to trip it. During this period of vibration, the frequency was varied continuously from 10 to 55 CPS with a double amplitude (total excursion) of 0.030 inch. The actuator should not operate the power cable during this period of vibration.

The actuator was then placed in an altitude chamber at a pressure simulating 18,500 feet. It was then vibrated for thirty minutes in each plane. Upon completion of the vibration in each plane, the altitude was raised to clear the actuator. The altitude was then reduced and the release was armed to ascertain the limits of firing.

4.5.2 Test Setup:





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Subsidiary of the Aro Equipment Corporation
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4.5.3 Test Results:

4.5.3.1 Ambient:

PLANE OF VIBRATION	VIBRATION CYCLE	REMARKS	
X	30 minutes	No fire	OK
Y	30 minutes	No fire	OK
Z	30 minutes	No fire	OK

4.5.3.2 Altitude:

PLANE OF VIBRATION	VIBRATION CYCLE	ALT. CLEARED	ALT. RAISED	ALT. ARMED	REMARKS
X	30 minutes at 18,500 10-55 CPS		22,000	20,000	No fire - raised alt. to 20,400 - fired
		19,950	22,000	19,800	Fired - OK
		19,925	22,000	19,800	Fired - OK
		19,930	22,000	19,700	Fired - OK
		19,950	22,000	19,600	No Fire - OK
Z	30 minutes at 18,500 10-55 CPS		22,000	20,000	No fire - raised alt. to 20,550 - fired
		19,950	22,000	19,800	Fired - OK
		19,950	22,000	19,700	Fired - OK
Y	30 minutes at 18,500 10-55 CPS		22,000	20,500	No fire - raised alt. to 23,000 - no fire
		20,200	24,000	19,800	No fire
		20,100	24,000	20,000	No fire
		20,500	24,000	21,000	Fired
		20,050	24,000	19,800	Fired - OK
		19,300	22,000	19,700	Fired - OK
		19,850	22,000	19,600	Fired - OK
		19,500	22,000	19,500	No fire - OK

4.5.4 Remarks:

The results obtained immediately after vibration showed that the altitudes at which the mechanism fired were somewhat higher than normal operation, but still within specification. The only exception was that which appeared after vibrating in the 'Y' axis. Subsequent actuations were satisfactory.

APPENDIX H

QUALIFICATION TESTS PERFORMED ON PACIFIC SCIENTIFIC PARACHUTE ACTUATOR NUMBER 1201118-0

Report	Page
Firewel Report dtd 3 Nov 1961	39 - 49

ARO
Firewel THE FIREWEL CO., INC.
Subsidiary of the Aro Equipment Corporation
3695 BROADWAY BUFFALO 25, N. Y.

QUALIFICATION TESTS PERFORMED
ON PACIFIC SCIENTIFIC PARACHUTE ACTUATOR
Number 1201118-0

By The Firewel Company, Buffalo, NY

Prepared by:

James K. Seitler
Design Engineer

Approved by:

Alfred C. Barmasse
Project Engineer

Robert F. Zumwalt
Director of Research

THE FIREWEL CO., INC.
Subsidiary of the Aro Equipment Corporation
3695 BROADWAY BUFFALO 25, N. Y

TABLE OF CONTENTS

ARO
THE FIREWEL CO., INC.
Subsidiary of the Aro Equipment Corporation
3695 BROADWAY BUFFALO 25, N. Y.

1. PURPOSE:

Perform the portion of the qualification testing of the Pacific Scientific Corporation parachute actuator Number 1201118-0 assigned to the Firewel Company.

2. REFERENCE SPECIFICATION:

Pacific Scientific Corporation:
Number 657 -- Qualification Test Procedure for Drogue Deploy Actuator Number 1201118-0.

WADC Exhibit WCLSJ-1-23075, Appendix 'A', dated November 26th, 1957

ASD Document Data Report 642 as changed by Conference of September 19th 1961.

3. QUANTITY OF TEST ARTICLES:

One each -- Drogue deploy actuator Number 1201118-0, Serial Number 203

4. TEST PROCEDURE:

Paragraphs 4.1, 4.2, 4.5, 4.6 and 4.8.3 of ASD Document Data Report No. 642 as changed by the Conference of September 19th, 1961 were performed by the Firewel Company. Numbers in parenthesis refer to the referenced document.

4.1 Examination of Product - (4.1):

4.1.1 The specimen examined conformed to the applicable drawing except that the guide bushing for the arming pin had not been assembled into the unit.

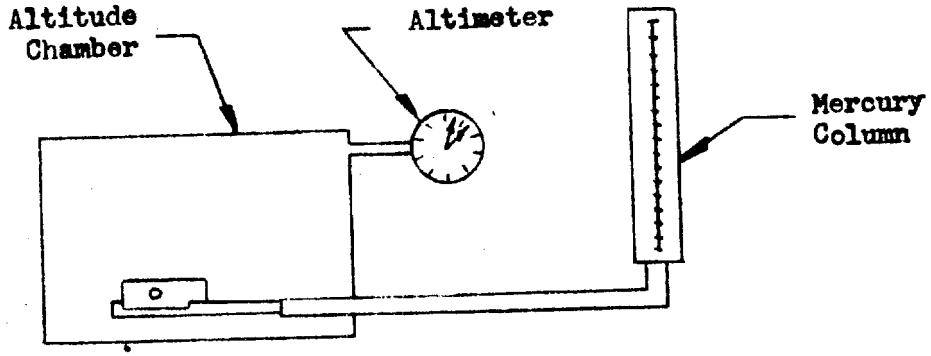
4.2 Venting Test (4.2):

4.2.1 Test Procedure:

With the arming pin removed, the actuator was placed in an altitude chamber. A rubber tube was placed over the cable guide and connected to a mercury column.

The altitude was raised to 25,000 feet and then lowered at a rate between 150-250 FPS. The difference in the mercury column and altitude chamber readings should not exceed 100 feet. This test was performed twice.

4.2.2 Test Setup:



4.2.3 Test Results:

ALTITUDE CHAMBER READINGS	Hg COLUMN (± 100 FEET)
25,000 feet	OK
20,000 feet	OK
15,000 feet	OK
10,000 feet	OK
0	OK

4.2.4 Remarks:

The actuator performed satisfactorily

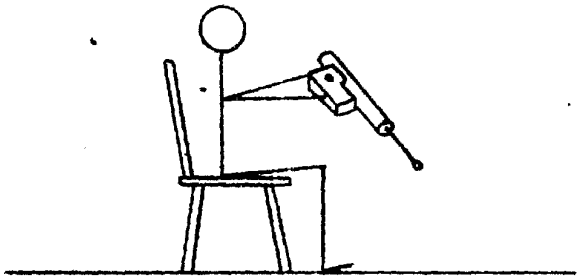
THE FIREWEL CO., INC.
Subsidiary of the Aro Equipment Corporation
3695 BROADWAY BUFFALO 25, N. Y.

4.3 Timer Starting Life Test (4.5):

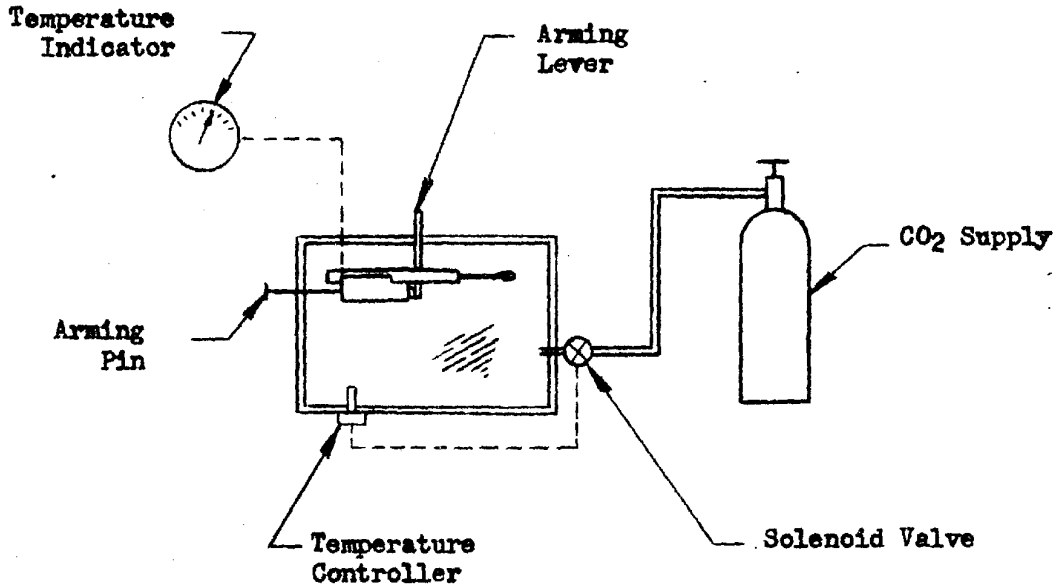
4.3.1 Test Procedure:

With the power spring NOT loaded, the power gear train was started by extracting the arming pin 300 times at room temperature. The same starting operation was conducted an additional 200 times, between -60° and -65°F.

4.3.2 Test Setup:



AMBIENT TEMPERATURE (74°F) CONDITIONS



-60/-65°F CONDITIONS

4.3.3 Test Results:

TEST CONDITIONS	TEST	REMARKS
Ambient test	300 cycles	OK
-60°/-65°F test	200 cycles	OK

4.3.4 Remarks:

The arming pin hole in the body casting showed signs of wear. This was due to the fact that the units were supplied without bushings as noted in paragraph 4.1.

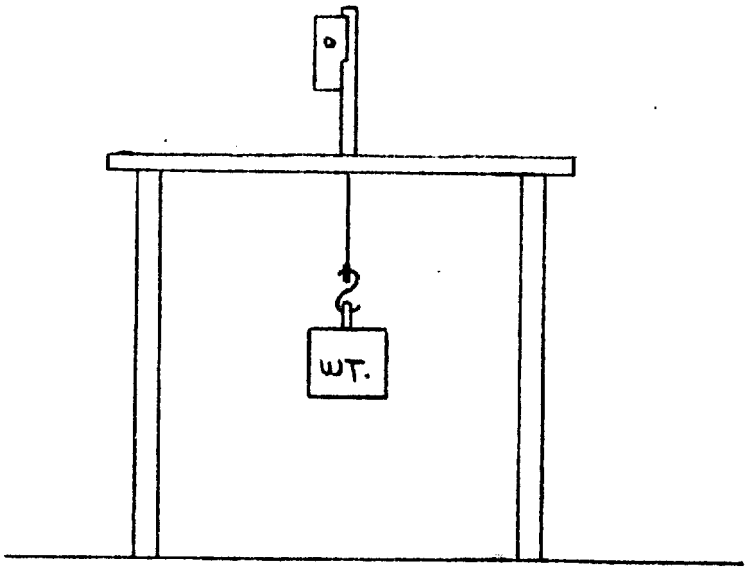
4.4 Power Actuation and Life Test (4.6):

4.4.1 Test Procedure:

The actuator was loaded, mounted in a test fixture and operated fifty times with a 30-pound weight attached to the swaged fitting on the power cable. The test was repeated 25 times with a 100-pound weight. The 100-pound weight was lifted at least two inches each time.

The actuator was loaded each time with the resetting tool Number 1201138.

4.4.2 Test Setup:



THE FIREWEL CO., INC.
Subsidiary of the Aro Equipment Corporation
3695 BROADWAY BUFFALO 25, N. Y.

4.4.3 Test Results:

TEST	LOAD	REMARKS
50 cycle	30 pounds	OK
25 cycle	100 lbs - 2" lift	OK

4.4.4 Remarks:

Actuator operated satisfactorily.

THE FIREWEL CO., INC.
Subsidiary of the Aro Equipment Corporation
3695 BROADWAY BUFFALO 25, N. Y.

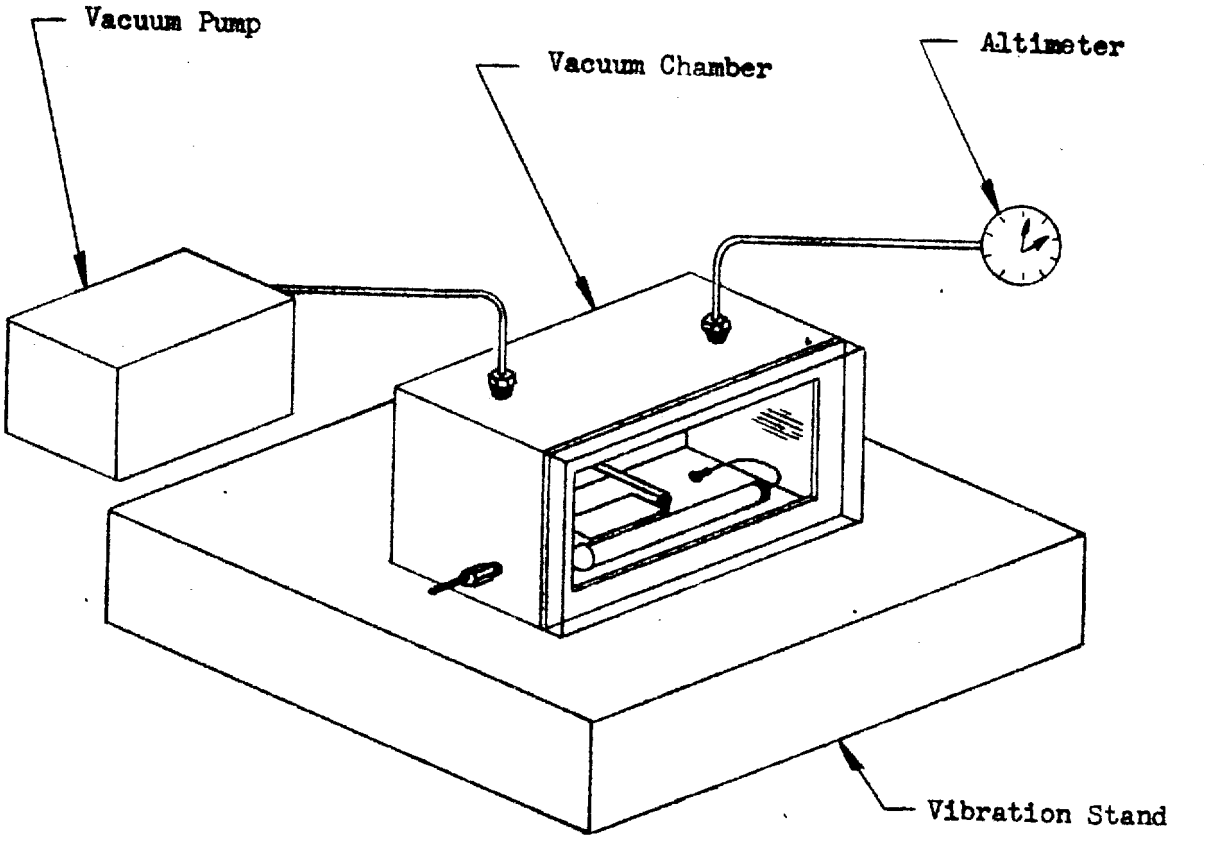
4.5 Vibration (4.8.3):

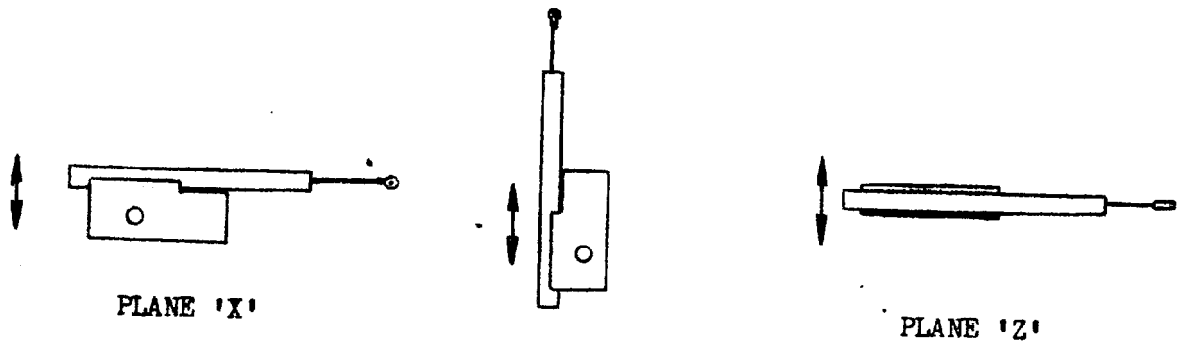
4.5.1 Test Procedure:

The actuator, cocked and with the arming pin inserted was subjected to linear vertical vibration for thirty minutes in each of three mutually perpendicular planes on a vibration stand. When mounted in a horizontal plane, the actuator was mounted upside down. In one of the positions, the actuator was mounted so that the pawl for the reel actuator, had the additional force of gravity tending to trip it. During this period of vibration, the frequency was varied continuously from 10 to 55 CPS with a double amplitude (total excursion) of 0.030 inch. The actuator should not operate the power cable during this period of vibration.

The actuator was then placed in an altitude chamber at a pressure simulating 17,800 feet. It was then vibrated for thirty minutes in each plane. Upon completion of the vibration in each plane, the altitude was reduced after the release was armed to ascertain the limits of firing.

4.5.2 Test Setup:





4.5.3 Test Results:

4.5.3.1 Ambient:

PLANE OF VIBRATION	VIBRATION CYCLE	REMARKS
X	30 minutes	No fire - OK
Y	30 minutes	No fire - OK
Z	30 minutes	No fire - OK

4.5.3.2 Altitude:

PLANE OF VIBRATION	VIBRATION CYCLE	FIRING ALTITUDE	REMARKS
X	30 minutes at 17,000 ft.	17,400	OK
Y	30 minutes at 17,800 ft.	17,050	OK
Z	30 minutes at 17,800 ft.	17,100	OK

4.5.4 Remarks:

Actuator Performed Satisfactorily.

APPENDIX J

SUMMARY OF TEST RESULTS

Tests		Part No.					
Number	Title	201	202	203	204	205	206
4.1	Examination of Product	F-1	-	F-1	-	-	-
4.2	Venting Test	P	-	P	-	-	-
4.3	Aneroid Cycling	-	-	-	P	P	-
4.4	Overpressure	-	-	-	P	P	-
4.5	Timer Starting Life Test	P	-	P	-	-	-
4.6	Power Actuation Life Test	P	-	P	-	-	-
4.7.2	Timer Accuracy	-	P	-	P	P	P
4.7.3	Aneroid Accuracy	-	P	-	P	P	F-4
4.7.4	Aneroid Hysteresis	-	-	-	P	P	-
4.7.5	Arming Pin Pull	-	-	-	F-7	F-7	-
4.8.1	High Altitude - Low Temperature	-	-	-	F-2 F-3	F-3	-
4.8.2	High Temperature	-	-	-	P	F-2	-
4.8.3	Vibration	F-2	-	F-2	-	-	-
4.8.4	Shock	F-2 F-6	-	F-2 F-6	-	-	-
4.8.4.1	Multiple Shock	-	P	-	P	-	P
4.8.5	Acceleration	P	-	P	-	-	-
4.8.6	Sand and Dust	-	P	-	-	-	-
4.8.7	Humidity	-	F-5	-	-	-	-
4.8.8	Salt Spray	-	F-5	-	-	-	-

Notes:

- P Passed specified test procedure
- F Failed to pass specified test procedure in the following area only
- F-1 Guide bushing for arming pin missing, otherwise passed
- F-2 Actuator firing not within applicable altitude limits
- F-3 Timing mechanism failed to fire within limits
- F-4 Actuator could not be cocked and was removed from testing
- F-5 Excessive corrosion was found within the actuator
- F-6 Actuator could not be cocked, was modified by Pacific Scientific Company
- F-7 Arming pin became prematurely disengaged

APPENDIX K

TEST REQUIREMENTS FOR QUALIFICATION

1.0 PURPOSE

To outline qualification procedure.

2.0 REFERENCE SPECIFICATION

WADC Exhibit WCLSJ-1-23075, Appendix A, 26 November 1957, "Automatic Parachute Ripcord Release".

3.0 QUANTITY OF TEST ARTICLES

Five complete actuators. Each test must be performed on each actuator unless otherwise noted.

4.0 TEST PROCEDURE

The tests will be conducted as follows:

4.1 EXAMINATION OF PRODUCT

All actuators shall be inspected to determine compliance with the referenced specification and applicable drawing.

4.2 VENTING TEST

With the arming pin removed, a rubber tube shall be placed over the cable guide and the other end of the tube shall be connected to an altimeter. Both the actuator and the altimeter shall be placed in an altitude chamber. The altitude shall be raised to 25,000 feet and then lowered at a rate not more than 250 fps nor less than 150 fps. The difference in the reading of the altimeter and the chamber altitude as the pressure is reduced shall not exceed 100 feet.

4.3 ANEROID CYCLING

The actuator shall be subjected to an aneroid accuracy test which shall be conducted prior to the start of the cycling test. With the arming pin inserted, the release shall be subjected to continuously varying altitude cycles at room temperature, from sea level to 35,000 feet and return to sea level. Upon completion of 1,000 cycles, an aneroid accuracy check shall again be made. The accuracy shall be within the requirements specified in Table I.

4.4 OVERPRESSURE

The actuator shall be subjected to an absolute pressure of 50 inches Hg for a period of one hour. For a period of not less than six hours following

this overpressure, the actuator shall not be subjected to any operation other than atmospheric pressure. An accuracy test shall then be made on the actuator and the accuracy shall meet the requirements specified in Table I.

4.5 TIMER STARTING LIFE TEST

Three actuators shall be tested to determine the starting reliability. With the power spring not loaded, the timing gear train shall be started by extracting the arming pin at room temperature 300 times. The same starting operation shall be conducted an additional 200 times with the release at a temperature between -60° and -65°F. All three actuators must operate each time.

4.6 POWER ACTUATION AND LIFE TEST

The three actuators used in test 4.5 shall be loaded and operated 50 times with a resisting force of 30 pounds. The actuators shall then be mounted on a test fixture with the cable end down and a 100-pound weight attached to the terminal swaging. The actuator shall lift the 100-pound weight two (2) inches each time. These tests will be conducted at room temperature.

4.7 PERFORMANCE TESTS

4.7.2 Timer Accuracy

When the arming pin is removed there shall be a delay of between .08 and .13 seconds at room temperature, -65°F and +165°F.

4.7.3 Aneroid Accuracy

The aneroid shall be checked in an altitude chamber to determine if the aneroid accuracy is within the limits specified in Table I. The accuracy shall be checked by taking the test chamber to 18,000, 19,800 and 18,400 feet respectively for the Type 117, 118 and 119, and lowering it to determine the release point. The leak indicator shall be checked. A leak equivalent to 3,000 feet altitude must be clearly detectable.

4.7.4 Aneroid Hysteresis

With the fixed aneroid setting as determined in 4.7.3, the release shall be taken to 30,000 feet in an altitude chamber and then lowered at a rate of 180 to 230 fps to compare the release point obtained under these conditions with that for the 18,000, 19,800 and 18,400 feet pressure altitude settings. The tolerance shall not exceed that specified in Table I.

4.7.5 Arming Pin Pull

With a spring scale attached to the knob and the knob affixed to the cable housing fitting, the force required to remove the knob from the fitting shall be measured and shall be between 15 and 20 pounds. The arming pin knob shall continue to be pulled and the force required to extract the arming pin from the actuator shall be measured and shall be between 10 and 20 pounds.

4.8 ENVIRONMENTAL TESTS

4.8.1 High Altitude - Low Temperature

The actuator shall be placed in a chamber and maintained at a temperature of approximately -65°F and a pressure equivalent to approximately 50,000 feet for a period of four hours. The actuator shall then be maintained at a temperature of approximately -65°F at atmospheric pressure for an additional period of four hours. Upon completion of the exposure and while at this temperature, the actuator shall be subjected to a timer accuracy, an aneroid accuracy, and a pull test simultaneously.

4.8.2 High Temperature

The actuator shall be subjected to high temperature in accordance with Procedure I of Specification MIL-E-5272, except that the actuator shall be maintained at the specified temperature for a period of 15 hours. While at this temperature, the actuator shall be subjected to a timer accuracy, an aneroid accuracy, and a pull test simultaneously.

4.8.3 Vibration

The actuator, cocked and with the arming pin inserted, shall be subjected to linear vertical vibration for a period of 30 minutes in each of three mutually perpendicular planes on a suitable vibration stand. When mounted in the horizontal plane, the actuator shall be mounted upside down. In one of the positions, the actuator shall be so mounted that the pawl for the reel actuator shall have the additional force of gravity tending to trip out this pawl. During this period of vibration, the frequency shall be varied continuously from 10 to 55 cps with a double amplitude (total excursion) of 0.030 inch. The actuator shall not operate the ripcord power cable during the period of vibration. The actuator shall then be placed in an altitude chamber and subjected to a pressure corresponding to 19,000, 16,500 and 15,000 feet respectively. The actuator shall be vibrated for at least 30 minutes in each plane. Upon completion of the vibration in each plane, the arming pin shall be pulled and the altitude brought up or down as applicable to ascertain the altitude at which the actuator operates. After the vibration tests, the actuator shall undergo the tests specified in paragraph 4.7 noting particularly whether the timer runs down without operating the ripcord. No looseness in the mechanism nor damage to any part of the actuator shall result from this test.

4.8.4 Shock

The actuator shall be mounted on sufficient mass and dropped from such a height that when decelerated by resiliant impact a deceleration of 30 g shall be obtained. The actuator cocked and with the arming pin inserted shall be tested with the axis mounted in three different planes. The actuator shall not pull the power cable during these tests. The actuator shall be mounted in a horizontal plane with a mounting side of the timer down on a shock testing machine in an altitude chamber. At an altitude of 1,000 feet above the elevation at which the actuator should theoretically trip, the arming pin shall be removed. While still at this altitude, the actuator shall be subjected to a 30 g shock and shall not trip the power cable. The test shall be repeated with the timer turned over 180° for a 30 g shock under the same conditions. The actuator shall then be subjected to a shock of 30 g in each of two additional planes at right angles to the first plane and at right angles to each other. The device shall be shocked under the same conditions in two different positions reversed to each other for each plane or a total of six different positions in all. A mechanism conforming to Specification JAN-S-44 may be used for conducting these tests, except that the calibrated spring shall have a constant (K) of 1,590 ± 100 pounds per inch in lieu of a spring rate of 5,000-5,500 pounds per inch. After the shock test, the actuator shall undergo the tests specified in paragraph 4.7. No looseness in the mechanism nor damage to any part of the actuator shall result from this test.

4.8.4.1 Multiple Shock

Three actuators attached to a mounting plate as for service shall be placed in an altitude chamber and taken 1,000 feet above basic setting of release #2. The arming pins shall be pulled on all three actuators. Firing of actuator #1 shall not cause actuators #2 and #3 to fire. While still at this altitude, the mounting plate with the releases installed shall be subjected to a 30 g shock. The shock will not cause actuators #2 and #3 to fire. The chamber altitude shall be reduced to determine the release point of actuators #2 and #3. The actuators shall be shocked in six different positions at room temperature (reference paragraph 4.8.4) in accordance with the procedures described above.

4.8.5 Acceleration

The actuator shall be mounted on the apparatus (centrifuge) and the apparatus shall be operated at a speed that will produce 30 g. The actuator shall be mounted first in a position parallel to the escapement assembly (usually horizontal) on the center of the turntable which is secured to the mounting platform of the centrifuge. The applied acceleration of 30 g shall be attained, stabilized, and maintained for a period of not less than one minute for each successive position. At the end of the one minute period, the arming pin shall be pulled. The actuator shall operate under these conditions and the apparatus (centrifuge) slowed.

The actuator shall then be checked and reset for the next test. The release shall be subjected to tests where the release is mounted in positions that will allow a 30 g force to be applied in the plus or minus direction along the x, y and z axes and the actuator set in six different positions for these axes. The actuator shall operate satisfactorily on all tests.

4.8.6 Sand and Dust

The actuator mounted in a parachute pack, or equivalent, shall be subjected to the sand and dust tests in accordance with Procedure I of Specification MIL-E-5272. The actuator shall then be subjected to the tests specified in paragraph 4.7. There shall be no evidence of sand or dust within the actuator.

4.8.7 Humidity

The actuator mounted in a parachute pack, or reasonable engineering facsimile, shall be subjected to humidity tests in accordance with Procedure I of Specification MIL-E-5272, for five cycles. At the completion of the test, the release shall be inspected for collection of moisture in the interior of the case, corrosion of metal parts, or other damage. At the completion of the fifth cycle, the actuator shall undergo the tests specified in paragraph 4.7.

4.8.8 Salt Spray

The actuator mounted in parachute pack, or reasonable engineering facsimile, shall be subjected to a salt spray in accordance with Procedure I of Specification MIL-E-5272 for a period of 50 hours. At the end of this period, the actuator shall undergo the tests specified in paragraph 4.7.

TABLE I

PRESSURE ALTITUDES

Pressure altitudes below which timer is blocked	Tolerance in feet		
	-65°F	Room Temp.	+160°F
1201117-0 19,000 ft.	±1000	±500	±1000
Pressure altitude above which timer is blocked			
1201118-0 16,500 ft. 1201119-0 15,000 ft.			

QUALIFICATION TESTING OF THE PACIFIC SCIENTIFIC COMPANY'S ALTITUDE SENSITIVE ACTUATORS, NOS. 1201117-0, 1201118-0 & 1201119-0